Aug. 7, 1962 W. W. DAVIDSON, JR., ET AL 3,048,099

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Filed July 16, 1959 8 Sheets-Sheet 1

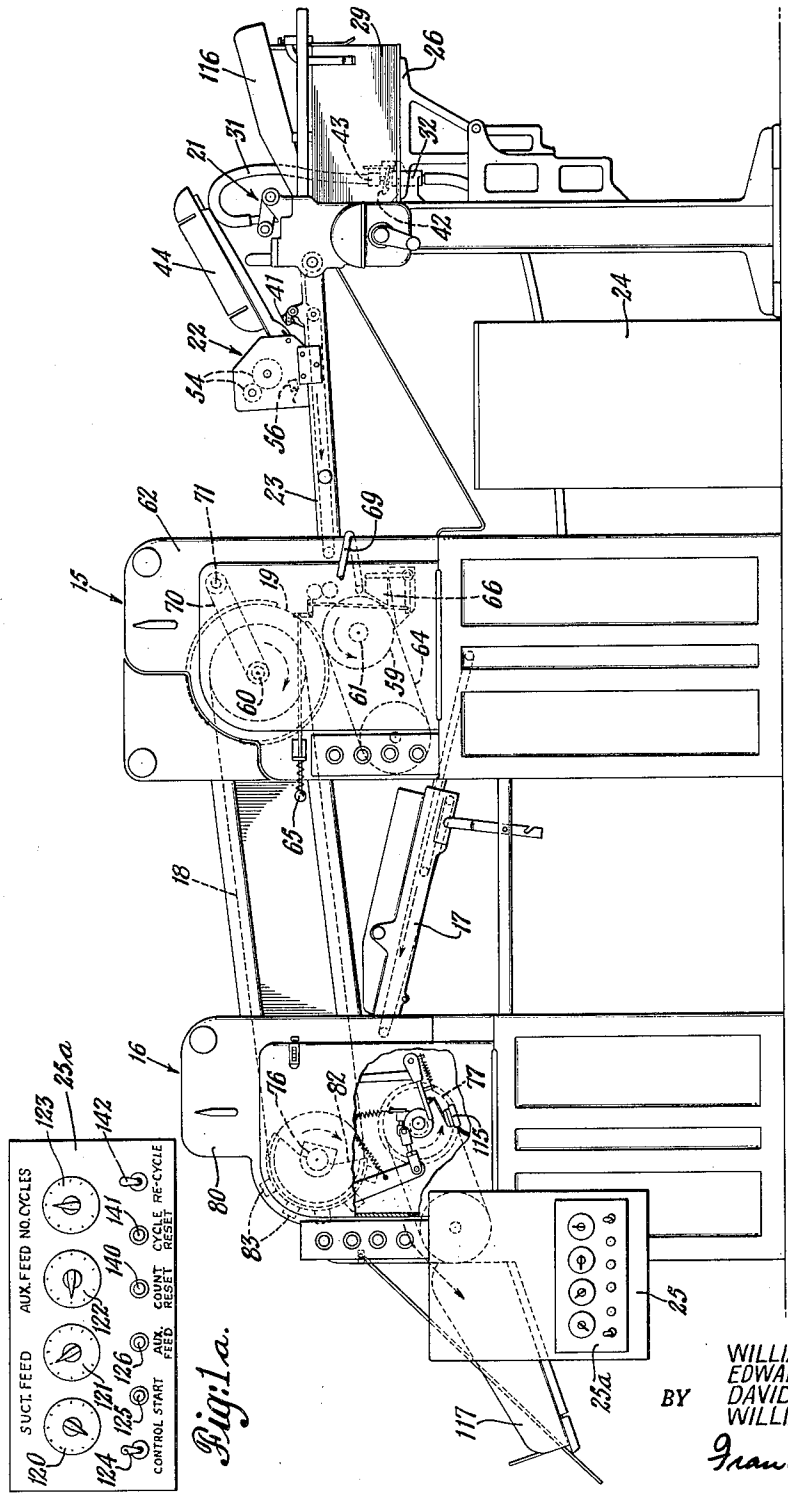

Fig. 1a.

Fig. 1.

INVENTORS
WILLIAM W. DAVIDSON, JR.
EDWARD F. DELL
DAVID E. DYKAAR
WILLIAM ROSS MARLIN

BY Frank E. Brahm

ATTORNEY

Aug. 7, 1962 W. W. DAVIDSON, JR., ET AL 3,048,099

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Filed July 16, 1959 8 Sheets-Sheet 2

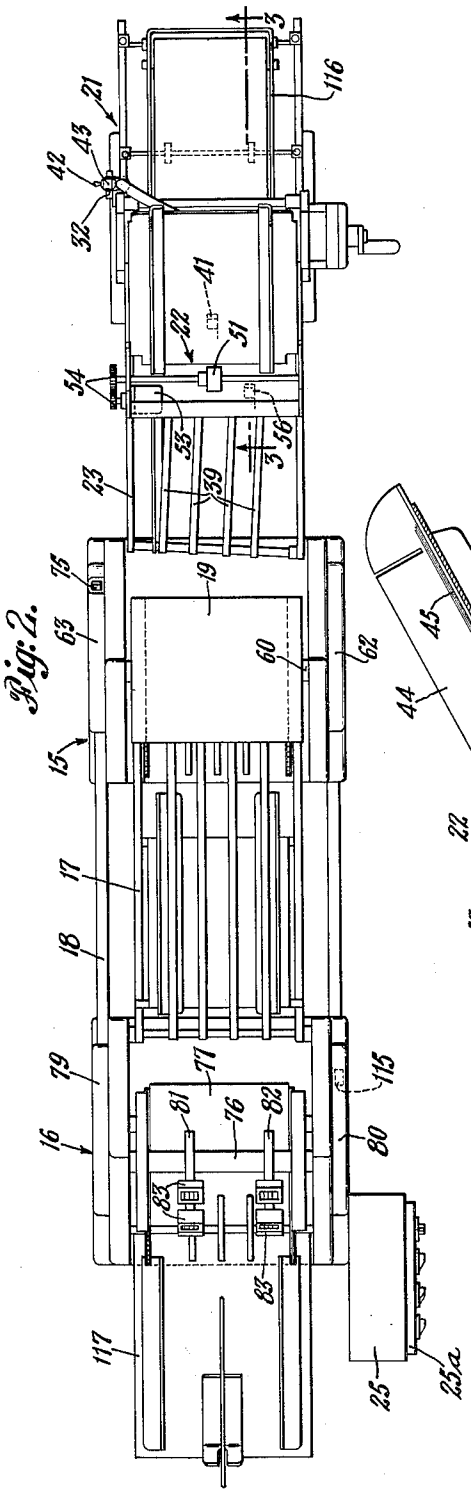

Fig. 2.

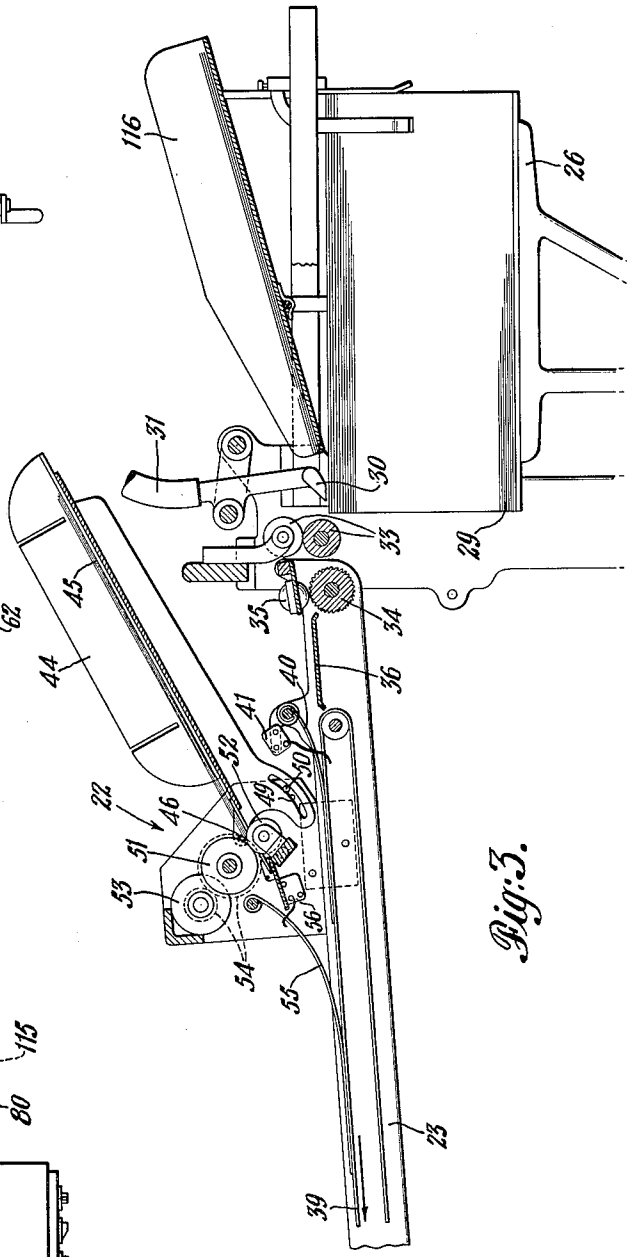

Fig. 3.

INVENTORS
WILLIAM W. DAVIDSON, JR.
EDWARD F. DELL
DAVID E. DYKAAR
WILLIAM ROSS MARLIN

BY Frank E. Brown
ATTORNEY

Aug. 7, 1962 W. W. DAVIDSON, JR., ET AL 3,048,099

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Fig:4.

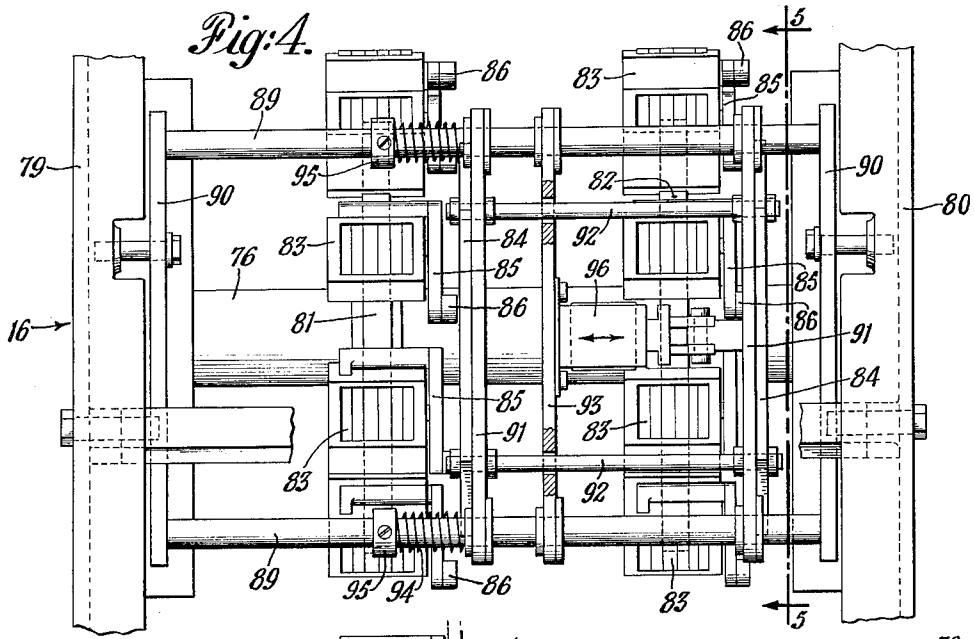

Fig:6.

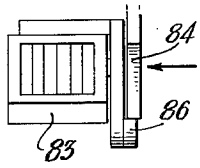

Fig:12.

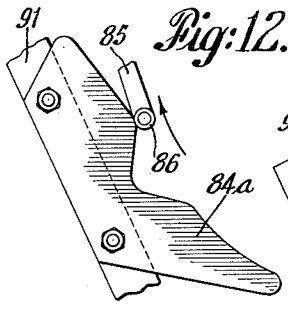

Fig:13.

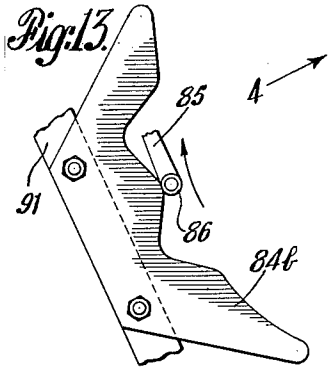

Fig:5.

INVENTORS
WILLIAM W. DAVIDSON, JR.
EDWARD F. DELL
DAVID E. DYKAAR
WILLIAM ROSS MARLIN

BY Frank T. Brahm
ATTORNEY

Aug. 7, 1962 W. W. DAVIDSON, JR., ET AL 3,048,099

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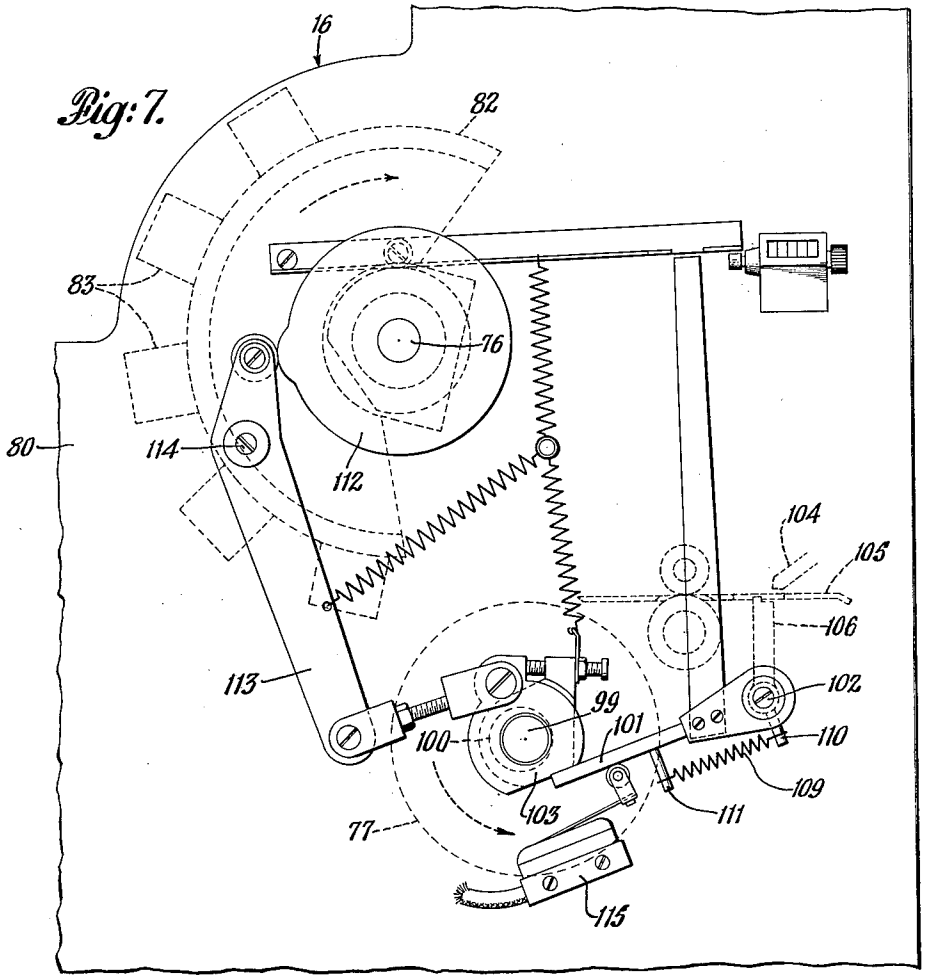
Filed July 16, 1959 8 Sheets-Sheet 4

Fig:7.



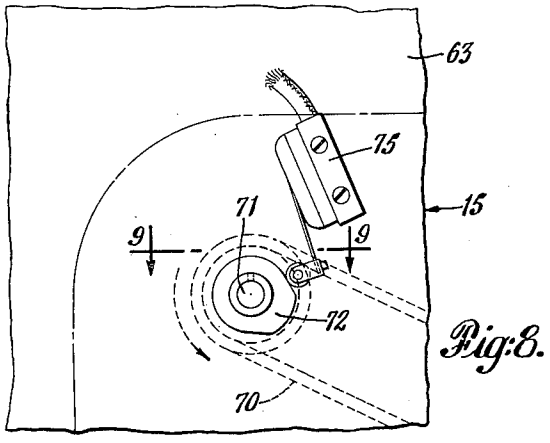


Fig:8.

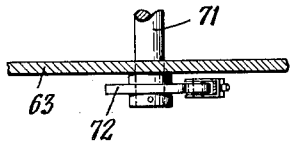


Fig:9.

INVENTORS
WILLIAM W. DAVIDSON, JR.
EDWARD F. DELL
DAVID E. DYKAAR
WILLIAM ROSS MARLIN

BY Frank G. Brahm

ATTORNEY

Aug. 7, 1962 W. W. DAVIDSON, JR., ET AL 3,048,099

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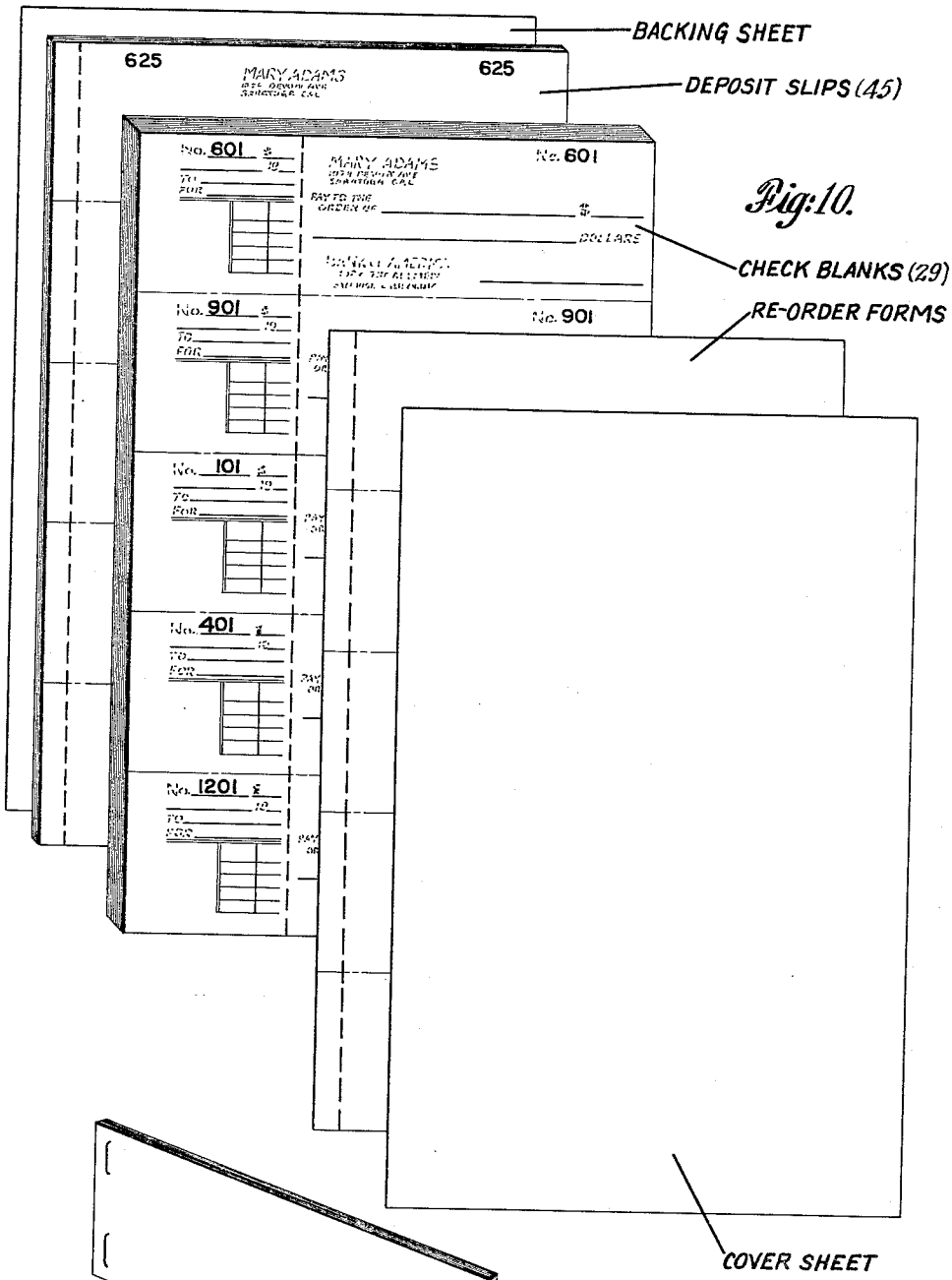

Fig. 10.

Fig. 11.

INVENTORS
WILLIAM W. DAVIDSON, JR.
EDWARD F. DELL
DAVID E. DYKAAR
WILLIAM ROSS MARLIN

BY Frank S. Graham
ATTORNEY

Aug. 7, 1962 W. W. DAVIDSON, JR., ET AL 3,048,099

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Filed July 16, 1959 8 Sheets-Sheet 6

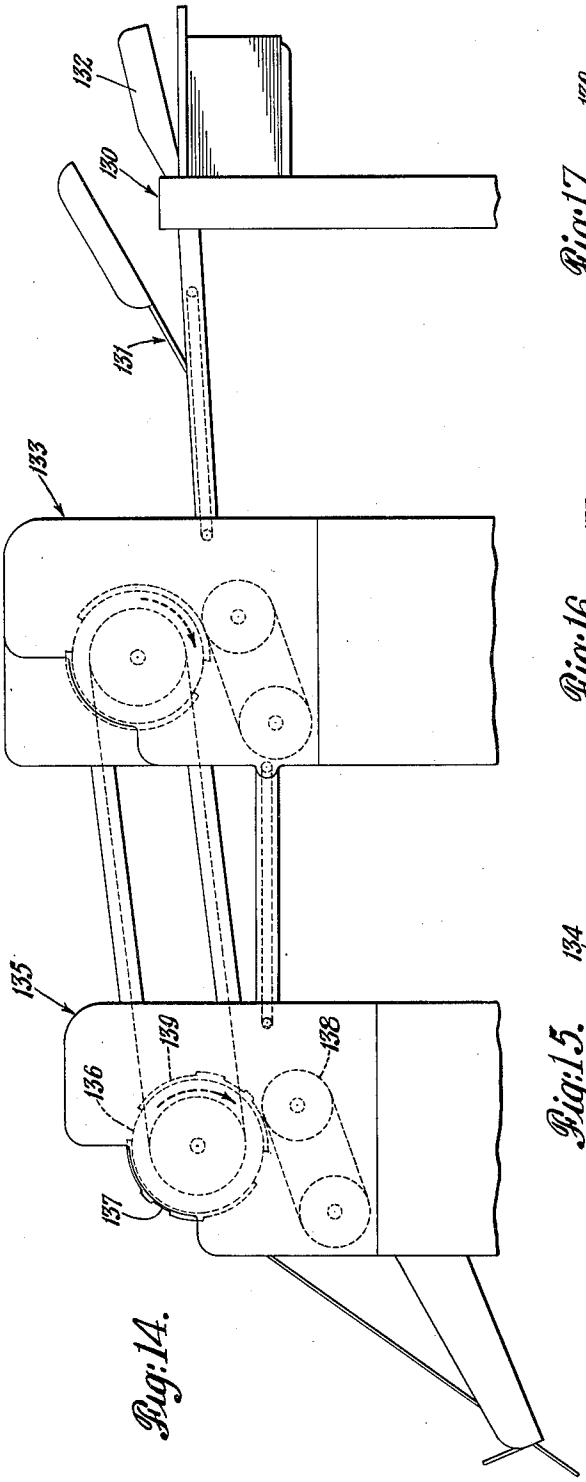

Fig. 14.

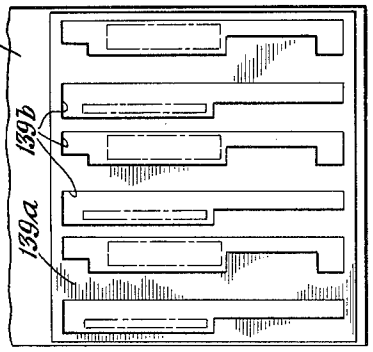

Fig. 17.

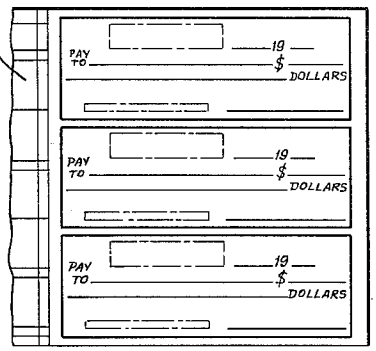

Fig. 16.

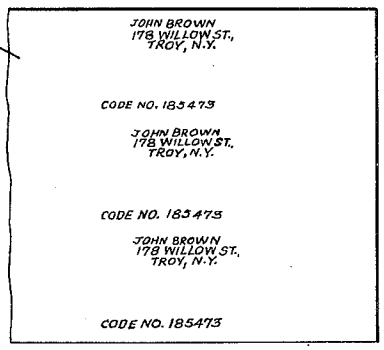

Fig. 15.

INVENTORS
WILLIAM W. DAVIDSON, JR.
EDWARD E DELL
BY DAVID E. DYKAAR
WILLIAM ROSS MARLIN
Frank T. Graham
ATTORNEY

PRINTING PRESS

Filed July 16, 1959 8 Sheets-Sheet 7

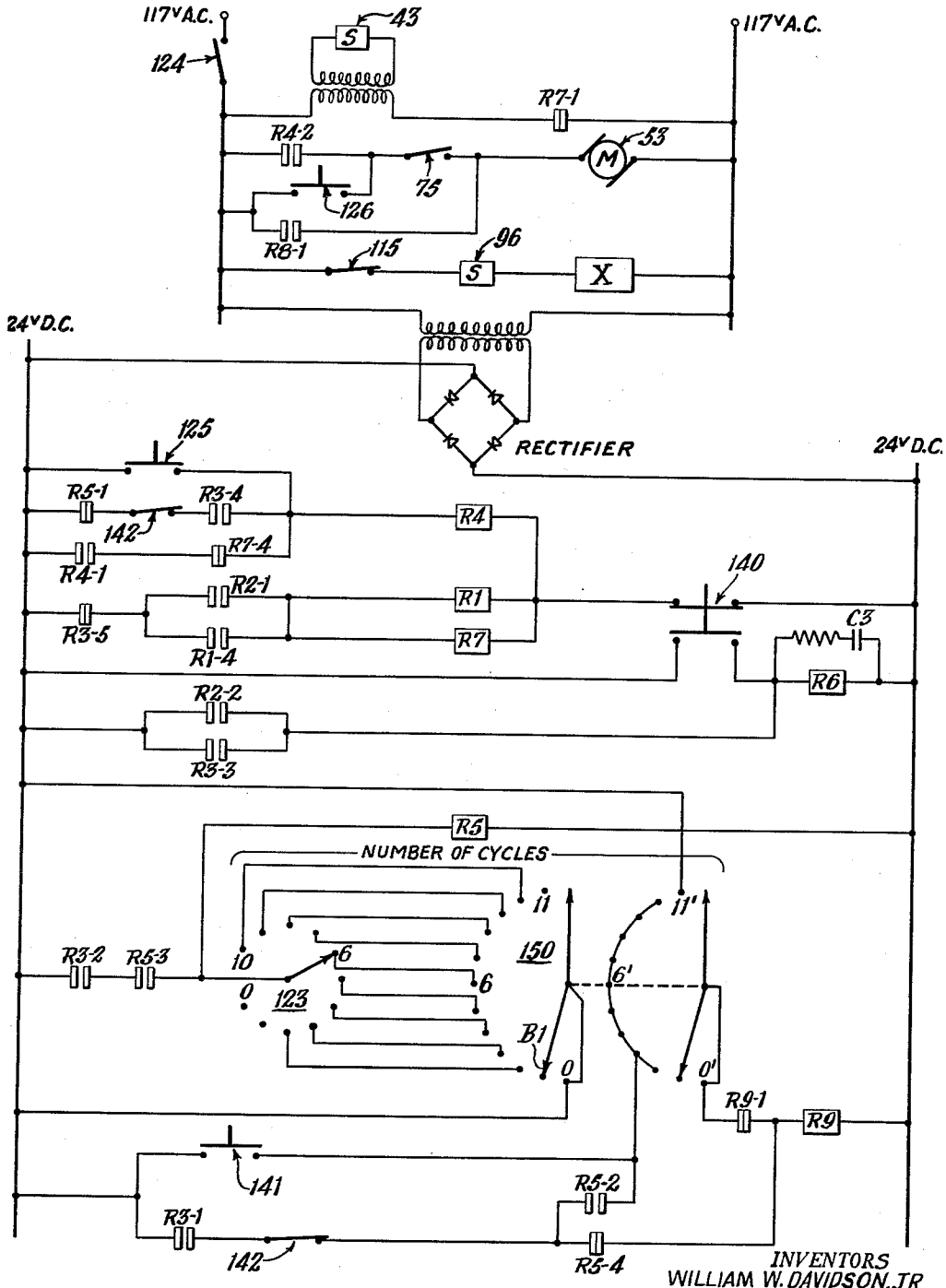

Fig. 18a.

INVENTORS
WILLIAM W. DAVIDSON, JR
EDWARD F. DELL
BY DAVID E. DYKAAR
WILLIAM ROSS MARLIN
Frank F. Brahm
ATTORNEY

Aug. 7, 1962 W. W. DAVIDSON, JR., ET AL 3,048,099

PRINTING PRESS

Filed July 16, 1959 8 Sheets-Sheet 8

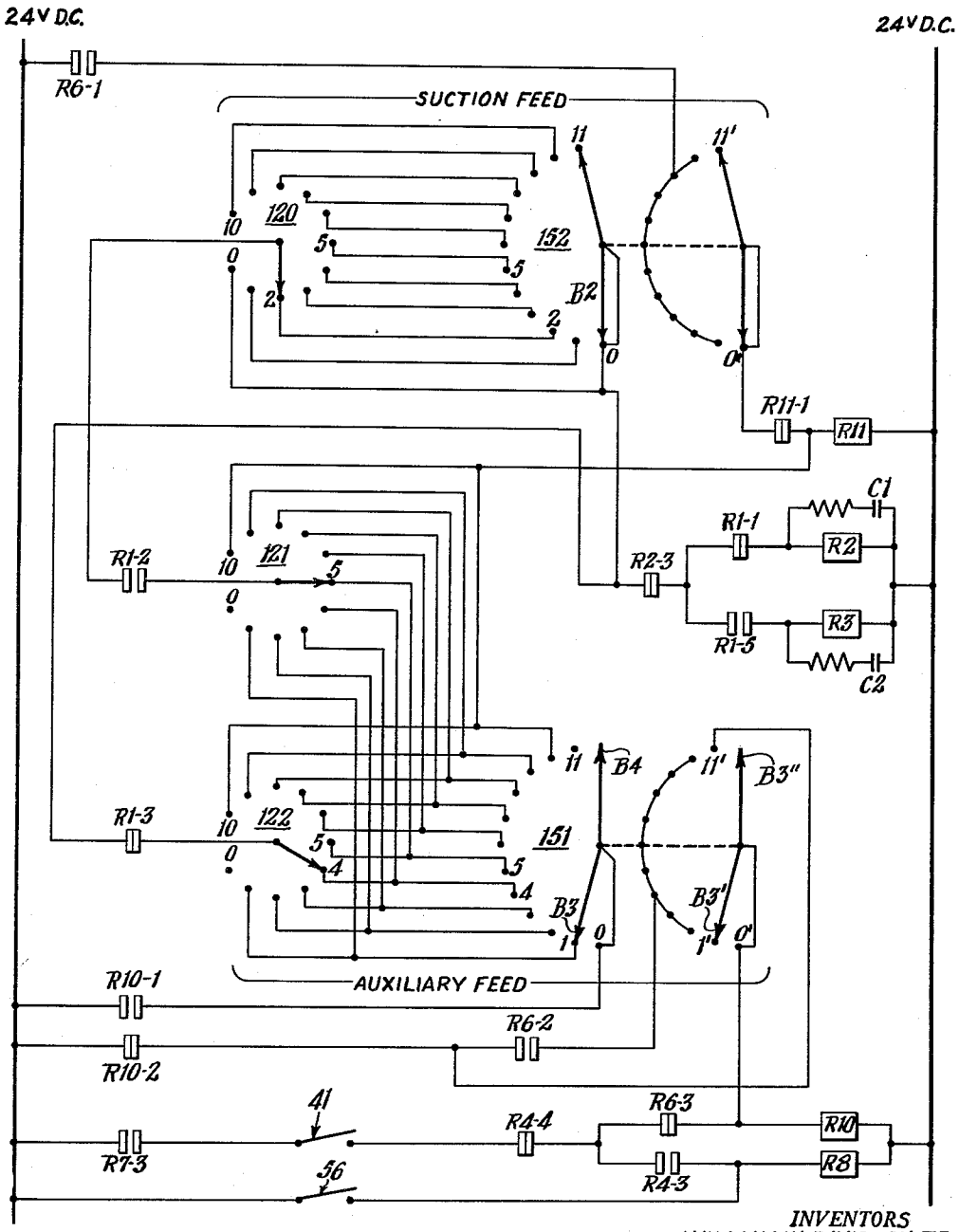

Fig: 18b.

INVENTORS
WILLIAM W. DAVIDSON, JR.
EDWARD F. DELL
BY DAVID E. DYKAAR
WILLIAM ROSS MARLIN
Frank J. Brahan
ATTORNEY

United States Patent Office 3,048,099 Patented Aug. 7, 1962

3,048,099

PRINTING PRESS

William W. Davidson, Jr., Port Washington, N.Y., Edward F. Dell, Stratford, Conn., and David E. Dykaar, Bayside, and William Ross Marlin, Wantagh, N.Y., assignors, by mesne assignments, to Mergenthaler Linotype Company, Brooklyn, N.Y., a corporation of New York

Filed July 16, 1959, Ser. No. 827,583
4 Claims. (Cl. 101—233)

This invention relates to apparatus for printing and collating a book or pad of checking account forms such as are generally issued by banks to their checking account depositors. More particularly, the invention relates to apparatus for automatically producing a series of check books, each of which comprises a number of personalized and sequentially numbered checks, a number of deposit slips, and a check book reorder form.

Due to the policy of many commercial banks whereby their checking account depositors are offered such supplementary services as personalized checks and banking by mail, and due to the more recent innovation of check printing with magnetic ink to permit machine handling of negotiated checks, serious problems have arisen in the production of books of checking account forms. Not the least of these problems is the severe increase in cost of such check books. A need has therefore arisen for equipment capable of economically printing and collating the desired forms, and delivering the latter in stacks ready for stapling or binding.

The present invention is intended to fill this need and toward that end apparatus is disclosed for automatically printing on each of a preselected number of check blanks and deposit slips the depositor's identification mark, i.e. the depositor's name and/or trademark, address and account number. This printing may be done with conventional or magnetic ink. In addition, each check as well as each stub is sequentially numbered for the depositor's convenience. The preselected number of checks and deposit slips, and a check book reorder form are then collated by the present apparatus into a stack ready for stapling and binding. Furthermore, the apparatus may be conditioned to automatically shut itself off after a preselected number of cycles or check books have been completed.

The invention will now be more fully described with reference to the accompanying drawings. In the drawings:

FIGURE 1 is a side elevational view of the present invention;

FIGURE 1*a* shows the panel of the automatic control unit which operates the present apparatus;

FIGURE 2 is a plan view of FIGURE 1;

FIGURE 3 is an enlarged elevational view taken on line 3—3 of FIGURE 2;

FIGURE 4 is a front elevational view of the numbering heads used with the present invention;

FIGURE 5 is a side elevational view taken on line 5—5 of FIGURE 4;

FIGURE 6 is a front elevational view of one numbering head;

FIGURE 7 is a side elevational view showing the control mechanism for the numbering heads;

FIGURE 8 is a fragmentary side elevational view showing one micro-switch operated by a cam;

FIGURE 9 is a plan view taken on line 9—9 of FIGURE 8;

FIGURE 10 is a perspective view of the component materials which comprise a typical series of check books;

FIGURE 11 is a perspective view of a completed check book;

FIGURE 12 shows an alternative numbering head cam which may be used with the present invention;

FIGURE 13 shows another alternative numbering head cam;

FIGURE 14 shows an alternative embodiment of the present invention to be employed when magnetic ink is used to print the depositor's identification mark on each check;

FIGURE 15 shows a sheet of paper which has been printed with the depositor's identification mark;

FIGURE 16 shows an etched plate for printing check forms;

FIGURE 17 shows a platen to be used with the plate of FIGURE 16; and

FIGURES 18*a* and 18*b* show the electrical circuits for controlling the present invention.

Referring to the drawings particularly FIGURES 1 and 2, the preferred embodiment of the present invention comprises in general, two, two cylinder printing presses **15** and **16**, arranged in tandem relationship, and joined by a conveyor table **17** and a chain power drive **18**. The plate-platen cylinder **19** of the press **15** carries a lithographic plate for printing the depositor's identification mark on the checks and deposit slips, and the segments **81** and **82** of the press **16** are equipped with a series of numbering heads for the purpose of sequentially numbering the checks and stubs.

Printing press **15** is furnished, on its feed side with a suction feeding mechanism **21**, for feeding blank check forms, and an auxiliary friction feeding mechanism **22**, for feeding blank deposit slip forms both feeding mechanisms being joined to the press by a conveyor table **23**. The feeders will be more fully described hereinafter with reference to FIGURE 3.

The power unit **24** for driving the machine is disposed directly beneath the conveyor table **23**, and the control box **25**, containing the automatic control equipment for operating the machine, which equipment will be described below with reference to the wiring diagrams (FIGURES 18*a* and 18*b*) is mounted on one side frame of press **16**, adjacent the delivery side thereof.

Referring now to FIGURE 3, as well as FIGURES 1 and 2, the check feeding mechanism **21** comprises an elevator **26** which holds a stack of check blanks **29**, a cam operated suction foot **30**, a suction tube **31** providing the foot **30** with reduced pressure from a suction pump, not shown, and an air control valve **32**. When the machine is running and there is suction at the foot **30**, the latter, by virtue of its cam operated motion, lifts one check blank **29** at a time off the stack on elevator **26**, and feeds it into the bite between the feed rollers **33**. The blank is moved by the feed rollers over a corrugated guide roller **34**, being pressed into engagement with this roller by a series of freely rotatable marbles **35** which rest thereon, thence across a bridge **36**, whereupon the check blank reaches the moving tapes **39** of conveyor table **23**, which eventually deliver the blank to printing press **15**. A light leaf spring **40** provides pressure between the blank and the tapes so that there is sufficient friction to move the blank along without slipping. A micro-switch **41**, so disposed that it is actuated by every check blank fed to printing press **15**, serves to count the number of check blanks delivered by the suction feeder, as will be described more fully with reference to FIGURES 18*a* and 18*b*.

As long as the machine is running, the cams (not shown) continue to impart a sheet feeding motion to the suction heads **30**. Therefore, the only way to stop the feeding of checks, short of shutting off the power to the machine, is to eliminate the suction at the foot. This is accomplished (see FIGURE 1) by opening the cover **42** of the air control valve **32**. In the present case, this function is controlled automatically by a solenoid **43**, disposed

directly above cover 42, which solenoid when energized holds the cover open.

The auxiliary deposit slip feeding mechanism 22 comprises a chute 44 which holds a fanned out stack of deposit slip blanks 45. The chute is pivotable about pin 46, but is limited to an acute angle of rotation by the cooperation of the arcuate slot 49, in chute 44, with the pin 50 projecting inwardly from the machine frame. Naturally, the angle of the chute is changed according to the weight of the paper stock being used. The deposit slip blanks are transferred from the chute 44 to the conveyor table 23 by feed rollers 51 and 52, which rollers are rotated through suitable gearing 54 by motor 53. It is obvious that although a motor is shown to feed deposit slips from the auxiliary feeder when the motor is energized, other means such as for example a solenoid operated clutch may be used to transmit rotary motion to the feed rollers 51 and 52 when the solenoid is energized. A light leaf spring 55 serves to press the deposit slip blanks against the conveyor tapes 39 in order to insure steady movement of the deposit slips along the conveyor table 23.

A micro-switch 56 is arranged for actuation by every deposit slip blank transferred from the chute 44 to conveyor table 23. This switch serves the dual purpose of counting the deposit slips fed from friction feeder 22, and of completing a circuit which maintains the motor 53 in energized condition as long as a deposit slip being fed holds the switch closed. The latter function of the switch will be mentioned again below with reference to an additional, cam operated, micro-switch.

Printing press 15 is basically of conventional design having a plate-platen cylinder 19 and a blanket cylinder 59, mounted on shafts 60 and 61 respectively, both journally supported between side frames 62 and 63 of the press, and rotated through suitable driving means. The chain delivery means 64, as usual, carries a paper gripper which pulls check and deposit slip blanks through the printing couple. Since the blanket must be wiped clean each time a new printing plate is secured to the cylinder 19, and automatic blanket cleaner is provided comprising an operating handle 65 and associated linkages, a sponge 66 which is brought into contact with the rotating blanket cylinder when handle 65 is utilized, and a tube 69 which provides the sponge with cleaning solution from a reservoir, not shown.

An endless chain 70 (FIGURES 1 and 8), trained about the printing cylinder shaft 60 and a camshaft 71, drives the camshaft in timed relation with the cylinder. As may be seen in FIGURES 8 and 9, a cam 72 mounted on the shaft 71 and rotatable therewith, actuates a micro-switch 75 for a brief interval once during each cycle of the machine. The cam operated micro-switch 75 serves, during the short time that its contacts are engaged to activate the auxiliary feeder motor 53 and commence the delivery of a deposit slip from the chute 44 to the conveyor table 23. The switch 75 then opens after only a portion of the deposit slip has passed between the feed rollers 51 and 52. At this point however, the sheet closes micro-switch 56 mentioned above, and the latter switch maintains the motor 53 in activated condition until the entire deposit slip blank has been fed. Note therefore, that only one deposit slip blank will be fed during each cycle and that regardless of the length of the blank being fed, the motor 53 will remain energized just the proper length of time for feeding that blank.

The check and deposit slip forms, which are printed on their undersides by the blanket cylinder 59 are delivered printed side up to the conveyor table 17 which carries the forms to the printing unit 16 wherein the forms are numbered.

The numbering unit 16 may be seen more clearly by referring to FIGURES 4 and 5. A shaft 76 rotatably mounted between the side frames 79 and 80, above an impression cylinder 77, is rotated in timed relation with the cylinder 19 of the press 15 by means of the chain power drive 18. The shaft 76 has mounted thereon a pair of segment plates 81 and 82, each of which plates carry a series of numbering heads 83, the heads on plate 81 serving to number the check blanks, and the heads on plate 82 serving to place upon each check stub a number identical to the number on the check blank associated with that stub. The number of heads 83 on each segment plate is determined by the number of check blanks on each sheet being printed. Since in the present illustration five check blanks are located on each sheet (see FIGURE 10), five numbering heads are shown for numbering the checks and five for numbering the stubs.

In order to bring about the sequential numbering of the check forms, the numbering heads 83 must be sequenced or indexed during each cycle of the machine. This is accomplished by locating an indexing cam 84 in alignment with the follower rollers 86 carried by the indexing levers 85 of each row of numbering heads, whereby as the shaft 76 rotates the follower rollers 86 will contact the cam aligned therewith and pivot the levers 85 in order to sequence the numbering heads. Since it is undesirable for the heads to be indexed during certain cycles of the machine, such as when deposit slips are being fed or when a sheet fails to feed, the indexing cams 84 are made translatable into and out of the path of the follower rollers 86 so that the heads 83 will not be indexed when the cams 84 are out of the path of the rollers 86. To provide for the movement of the cams 84, a pair of cross rods 89 are fixed between two support bars 90 mounted adjacent the side frames 79 and 80 of the press 16. A pair of plates 91 slidably mounted on the cross rods 89 are interconnected by a pair of short rods 92 which maintain the plates 91 at a fixed distance from one another. Each of the plates 91 has one of the cams 84 mounted thereon, hence the cams are slidable along the cross rods 89, into and out of the paths of the follower rollers 86, and the cams are maintained apart at a distance equal to the distance between the two segment plates 82. The cams are normally held out of indexing position, i.e. out of the paths of the follower rollers 86, by a pair of springs 94 each of which surrounds one of the cross rods 89 and is backed by a collar 95 fixed to the respective cross rod. A third plate 93 fixedly mounted on the cross rods 89 between the slidable plates 91, is provided with apertures through which the short rods 92 pass, and has mounted thereon a solenoid 96 whose armature is connected to one of the slidable plates 91. Upon energization of the solenoid 96, the plates 91 will be moved leftwardly (in FIGURE 4) against the force of the springs 94, and hence the cams 84 will be moved into the paths of the follower rollers 86 (see FIGURE 6). Upon deenergization of the solenoid 96, the springs 94 return the cams 84 to non-indexing position.

As was mentioned before, it is desirable to shift the cams 84 out of indexing position whenever a sheet of check blanks fails to feed in order to avoid a break in the sequential numbering of the checks. To achieve this result, the well known no-sheet feed thrownout mechanism, illustrated in FIGURE 7, is employed to deenergize the solenoid 96. As usual, the impression cylinder 77 is mounted on a shaft 99 journally supported adjacent its ends in a pair of eccentric bearings 100. A latch 101, rotatably mounted on a shaft 102, normally engages the shoulder of a latch plate 103 and holds the cylinder 77 in sheet printing position. When a sheet fails to feed, a feeler finger 104 drops through a slot in the feed table 105 and pivots a lever 106 also fixed to the shaft 102, thus pivoting the shaft 102 and tensioning a spring 109 disposed between a pin 110 fixed to the shaft 102 and a pin 111 projecting from the latch 101. As the shaft 76 continues to rotate, the cam 112 mounted thereon serves to pivot the lever 113 about the pin 114 thus reducing the pressure between the latch plate 103 and the latch 101 thereby permitting the spring 109 to pivot the latch 101 out of engagement with the latch plate 103 whereupon the cylinder 77 moves downwardly away from the path of the numbering heads 83. A normally closed micro-switch

115 forming part of the energizing circuit for the solenoid 96 is so positioned below the latch 101 that when the latch is pivoted by the spring 109, it opens the microswitch 115, and deenergizes the solenoid whereupon the springs 94 move the indexing cams 84 out of indexing position. Upon delivery of another sheet of check blanks, the latch and latch plate reengage and the switch 115 is permitted to close thus reenergizing the solenoid 96.

It may be seen in FIGURE 5 that the contour of the cam 84 is such that it serves to advance numbering head one unit for each revolution of the shaft 76. A cam of this shape is employed, therefore, when check books having one check per page are being produced. When check books having two or three checks abreast per page are produced, it is apparent that the numbering heads employed to number the checks should be indexed two or three units respectively with each revolution of the shaft 76. To accomplish this multiple indexing, cams 84*a* and 84*b* shown in FIGURES 12 and 13 respectively are utilized; cam 84*a* causing double indexing of each numbering head per cycle and cam 84*b* causing triple indexing per cycle.

For operation, the present invention is arranged as shown in FIGURE 1. A stack of sheets, each preprinted with five check blank forms and five stubs (see FIGURE 10), is placed in the suction feeder elevator 26. Each of the five checks per page will be printed with a different depositor's identification mark, thus the apparatus will actually produce check books for five different depositors at the same time. The number five is of course arbitrary and any suitable number of checks per page may be used. A second stack of sheets each preprinted with five deposit slip forms is placed in the auxiliary or friction feeder chute 44, and a third stack of sheets each preprinted with five check book reorder forms is placed in the chute 116 disposed above the stack of check blanks. A printing plate bearing the identification marks of five different depositors correctly arranged to that each mark coincides with a different check blank is then mounted on the cylinder 19 of the press 15, and the numbering heads 83 allocated to each of the five depositors are set to the desired starting numbers for those depositors. Whether the starting number set for each depositor is the lowest or highest number in the series which will be printed for the depositor depends upon whether the printed sheets are delivered to the delivery tray 117 face up or face down; if the former, the highest numbered checks will be numbered first, if the latter, the lowest numbered checks will be numbered first. In this way, the final stack will always have the lowest numbered checks on top and the highest numbered checks on the bottom. The actual number set on a particular head depends upon the number of checks previously printed for the depositor associated with that numbering head. Thus, if a depositor has received six hundred checks in the past, the numbering head will be set to "601" and will be sequenced forwardly until the total number of checks in the present series are printed, assuming of course, that the checks are being delivered face down into the tray 117. If, however, the checks are being delivered face up, and say one hundred and fifty checks are to be printed, the numbering head will be set to "750" and sequenced backwardly to "601."

After the printing plate has been installed on the cylinder 19 and the numbering heads 83 have been set, the operator conditions the automatic control unit 25 for automatic machine operation by setting the control panel 25*a* shown enlarged in FIGURE 1*a*. If, for example, it is desired that each check book contain twenty-five checks, the selector switch 120 is set to "2" and the selector switch 121 is set to "5" thereby calling for twenty-five check blank forms per cycle from the suction feeder 21. Further, if each check book is to contain four deposit slips, the selector switch 122 is set to "4" thereby calling for four deposit slip blanks per cycle from the auxiliary feeder 22. Then, if it is determined to print one hundred fifty checks in this series for each depositor, the selector switch 123 is set to "6" whereby the apparatus will automatically produce, for each depositor, six check books of twenty-five checks each, and then automatically stop further feeding of check blanks and deposit slips. When all the preliminary operations are completed, the operator turns on the power to the driving motors and the suction pump, activates the automatic control unit 25 by actuating the control toggle switch 124, and commences automatic sheet feeding by depressing the start push button 125. If, before automatic sheet feeding begins, the operator wishes to check the image on the printing plate, he may depress the auxiliary feed push button 126 before he depresses the start push button, and deposit slip forms will be fed into the printing apparatus without disturbing the setting of the auxiliary feeder selector switch 122. The circuits for controlling the above mentioned operations will be fully described hereinafter with reference to FIGURES 18*a* and 18*b*.

Referring now to FIGURE 14, apparatus substantially identical to the apparatus of FIGURE 1 is shown. However, the apparatus of FIGURE 14 is adapted to produce checks from blank paper stock rather than from stock preprinted with check blanks, as was used with the apparatus already described, and further, the apparatus of FIGURE 14 is adapted to print the depositors identification mark in magnetic ink to permit machine handling of the checks. The sheet feeding mechanisms including a suction feeder 130, an auxiliary friction feeder 131, and a manual feeder chute 132 are identical to those described above. The press 133, which produces a printed sheet 134 such as that shown in FIGURE 15, is identical to the press 15 of FIGURE 1 with the exception that the depositor's identification mark is printed with magnetic ink. Note that in the present example, only three identification marks are printed on each sheet rather than five as described above. This, of course, does not affect the operation of the present invention since as mentioned before, the number of checks per sheet is entirely arbitrary.

The sheets 134 are fed from the press 133 to the press 135 wherein check forms are printed on each sheet in registry with the depositors information already printed thereon. The cylinder 136 of the press 135 is provided with an etched or letterpress plate 137 (see FIGURE 16) which offsets the check form images on to the blanket cylinder 138 which in turn transfers the images to the sheet 134, as they travel between the cylinder 138 and the platen 139 (see FIGURE 17). It will be noticed that the platen 139 has raised portions 139*a* corresponding generally to the raised lines on the printing plate 137, and depressed portions 139*b* corresponding generally to the areas on the sheet 134 where the depositor information has been printed. The reason for employing this type of platen is that the magnetic ink with which the depositor's identification mark has been printed is still wet at the time the check forms are printed on the sheet, hence to avoid the offsetting of the magnetic ink from the paper to the blanket 138, the portion of the platen in registry with the wet magnetic ink is adapted not to press the sheet against the blanket in those areas of the sheet which carry the wet magnetic ink. Theoretically, no harm would be done even if the magnetic ink were permitted to be offset on to the blanket, since the same depositor's identification mark is being printed on every sheet, however in actuality such a practice would give rise to stringent registration requirements which are avoided by using the type of platen described.

It is apparent, of course, that if it is desired to sequentially number the checks as described above, a third press similar to press 16 of FIGURE 1 could be placed in tandem with presses 133 and 135 of FIGURE 14, and the arrangement would produce check books similar to those described above.

FIGURES 18*a* and 18*b* show the electrical circuits with the control box 25 employed to control the feeding

of check blanks and deposit slips and to control the sequencing of the numbering heads. The circuits are shown in "straight" or "across-the-line" form in which the contacts of a switch are shown separated from the switch coil which operates them and arranged in circuits which they control. Thus, it is possible to arrange each coil circuit in a "straight" line between parallel lines representing the power source.

In the across-the-line diagram, the electromagnetic relays R1 to R11 will be found. Throughout the description which follows, these letters will be applied to the coils of the above designated relays. Also, with reference numerals appended thereto, they will be applied to the contacts of these relays. The electromagnetic switches are shown in deenergized condition.

In addition to the above electromagnetic switches, certain mechanically actuated switches, most of which have been referred to hereinbefore, are also located in the across-the-line diagram. These switches are given the same reference numerals which they bear in the previous description. Those switches which appear in the diagram but have not been mentioned before, and which may be seen in FIGURE 1*a* as well, are the following:

Count reset push button—**140**.

Cycle reset push button—**141**.

Recycle toggle switch—**142**.

Finally, the four selector switches **120–123** appear in the diagram along with the following three stepper switches:

Number of cycles stepper switch—**150**.

Auxiliary feed stepper switch, which also serves as the units suction feed stepper switch—**151**.

Tens suction feed stepper switch—**152**.

It is believed that the operation of the circuit can best be described by following through a typical machine operating cycle. Notice the positioning in FIGURES 18*a* and 18*b* of the aforementioned selector switches; the switch **123** is set for six cycles, the switches **120** and **121** are set for 25 checks per cycle, and the switch **122** is set for four deposit slips per cycle.

Initially, the control toggle switch **124** is closed to supply power to the circuits. Immediately, the solenoid **43** is energized to hold the cover **42** of the air control valve **32** open thus preventing the feeding of check blanks by the suction feeder. The start button **125** is then depressed to complete a circuit energizing the coil R4 whereupon the contacts R4–1 engage completing a self-holding circuit for the coil R4 through the contacts R4–1, R7–4, the coil R4, and the count reset push button **140**. The contacts R4–2 also engage, and thereafter as the cam operated micro-switch **75** closes, a circuit is completed to energize the auxiliary feeder motor **53** whereby the delivery of a sheet of deposit slips to the conveyor **23** is initiated. The micro-switch **75** remains closed for only a short time, but the partially delivered sheet closes the micro-switch **56** (FIGURE 18*b*), thus completing a circuit to energize the coil R8. The contacts R8–1 immediately engage completing a circuit to maintain the motor **53** energized until the entire sheet of deposit slip blanks is delivered to the conveyor **23**.

At the time that the coil R4 is energized, the contacts R4–3 engage so that every time the micro-switch **56** is closed by a sheet being fed, a circuit is completed through the micro-switch **56**, the contacts R4–3, the contacts R6–3 and the coil R10, whereby the coil R10 is energized. As a result, the stepper switch **151** is advanced one position. As the cam operated switch **75** continues to close once during each cycle of the machine, the above operations are repeated, i.e. deposit slip blanks are fed to the conveyor by the auxiliary feeder and the stepper switch **151** is advanced one position for each sheet. When the brush B3 of the stepper switch **151** reaches contact number 4 (after four sheets of deposit slips have been fed), a circuit is completed through the contacts R10–1 (engaged due to the energization of coil R10), the brush B3, the line 4—4 between stepper switch **151** and selector switch **122**, the contacts R1–3, R2–3, R1–1, and the coil R2, to energize the coil R2. The contacts R2–3 open immediately to break the circuit, but the coil R2 remains energized for a short time as the capacitor C1 discharges across it. The contacts R2–2 engage to complete a circuit energizing the coil R6, which coil remains energized by means of the capacitor C3 even after the contacts R2–2 disengage. The contacts R6–2 engage completing a circuit through the contacts R10–2, R6–2, the brush B3′ of the stepper switch **151**, and the coil R10, to energize the coil R10, whereupon the stepper switch **151** advances one position. The contacts R10–2 immediately open to deenergize the coil R10 and then immediately close again. This alternate energization and deenergization of the coil R10 continues until the stepper switch **151** has returned to its home position.

At the time that the coil R2 is energized, the contacts R2–1 engage to complete a circuit through the contacts R3–5, R2–1, the coil R1, and the push button **140** to energize the coil R1, and a second circuit is completed to energize the coil R7. The contacts R1–4 immediately engage to maintain the coils R1 and R7 in energized condition. The contacts R1–1 and R1–3 disengage, and the contacts R1–2, and R1–5 engage. The contacts R7–4 disengage thus breaking the self-holding circuit for the coil R4 and deenergizing that coil, causing the contacts R4–2 to disengage. Thereafter, the closing of the cam operated micro-switch **75** will not serve to energize the motor **53** and deposit slip sheets will no longer be fed from the auxiliary feeder. At the same time, the contacts R7–1 disengage to break the circuit energizing the solenoid **43**, whereby the cover **42** of the air valve will be permitted to close, and sheets of check blanks will be fed by the suction feeder. The contacts R7–3 also close so that as the check blanks travelling on the conveyor **23** close the micro-switch **41**, a circuit will be completed through the contacts R7–3, the switch **41**, the contacts R4–4 and R6–3, and the coil R10, to energize the coil R10 and advance the stepper switch **151**, now serving as the units counter for sheets fed by the suction feeder, one position. After the first sheet of check blanks passes through the numbering unit **16**, the contacts within the box "X" (FIGURE 18*a*) engage to complete a circuit for energizing the solenoid **96**, whereby the cams **84** are moved into position for indexing the numbering heads. Should a sheet fail to feed, the micro-switch **115** will open, as described above to deenergize the solenoid **96**, and halt the indexing of the heads. The stepper switch **151** will continue to advance one position for each sheet of checks which is fed. After the tenth sheet is fed, a circuit will be completed through the contacts R10–1, the brush B3, the line 10—10 between the stepper switch **151** and selector switch **121**, and coil R11, to energize the coil R11 and advance the stepper switch **152** one position, indicating ten sheets of check blanks. When the eleventh sheet is fed by the suction feeder, a circuit is completed through the contacts R10–2, the contact **11′** of the stepper switch **151**, the brush B3′, and the coil R10, to energize the coil R10 and advance the stepper switch **151** one position whereby the brushes B3″ and B4 will engage the contact 1′ and 1 respectively. After the twentieth sheet of checks has been fed, the stepper switch **152** advances a second time. When the twenty-fifth sheet is fed by the suction feeder, the brush B3 engages contact 5 of the stepper switch **151** completing a circuit through contacts R10–1, the brush B3, the line 5—5 between the stepper switch **151** and the selector switch **121**, the contacts R1–2 (engaged since coil R10 is energized), the line 2—2 between the selector switch **120** and the stepper switch **152**, the brush B2, the contacts R2–3, the contacts R1–5, and the coil R3, to energize the last named coil. As a result, the contacts R3–5 disengage deenergizing the coils R1 and R7. The contacts R7–1 thereupon engage reenergizing the solenoid 43 which maintains the valve cover **42** open

and arrests the feeding of sheets by the suction feeder. Although the contacts R1–5 also disengage, the coil R3 remains energized for a short time by means of the capacitor C2. Contacts R3–3 engage when the coil R3 is energized, in order to complete a circuit energizing the coil R6. The contacts R6–2 engage completing a circuit energizing the coil R10, which circuit is then broke by the disengagement of contacts R10–2. The alternate energization and deenergization of the coil R10 continues until the stepper switch 151 returns to home position. When the contacts R6–1 engage, a circuit is completed for energizing the coil R11 through the contacts R11–1, which circuit makes and breaks intermittently until the stepper switch 152 returns to home position. The contacts R3–1 engage upon energization of coil R3 and complete a circuit to energize the coil R9 through the recycle switch 142 and the contacts R5–4. Upon energization of the coil R9, the stepper switch 150 advances one position. The contacts R3–4 also engage completing a circuit for reenergizing the coil R4 which restarts the cycle just described.

After six check books per depositor have been printed and collated, the brush B1 of stepper switch 150 engages contact 6 of the stepper switch thereby completing a circuit through the line 6—6 between the stepper switch 150 and the selector switch 123, and the coil R5, to energize that coil. Contacts R5–3 engage completing a self-holding circuit through the contacts R3–2 (engaged since coil R3 is energized). Contacts R5–1 disengage preventing the reenergization of the coil R4 by engagement of the contacts R3–4, hence a new cycle will not commence. Contacts R5–2 engage completing a circuit for the energization of coil R9 through the contacts R9–1, which circuit will make and break until the stepper switch 150 returns to home position.

Several additional features are provided to make the present apparatus more flexible. Thus, if for some reason the machine operation is halted in the middle of a cycle, the stepping switches 151 and 152 may be returned to home position merely by depressing the count reset push button 140. This completes a circuit energizing the coil R6, which as described above serves to intermittently energize both coils R10 and R11 through contacts R6–2 and R6–1 respectively. Furthermore, the stepping switch 150 may be returned to home position by depressing cycle reset push button 141, which serves to complete a circuit for intermittently energizing the coil R9. In addition, if it be desired to halt production before the full number of cycles has been completed or it be desired to run additional cycles without disturbing the setting of the control panel 25*a*, the double-pole recycle toggle switch 142 is opened. It may be seen that when this is done, the coil R4 will not automatically be reenergized at the completion of a cycle and the completed cycle will not be registered by the stepper switch 150.

The invention has been shown and described in preferred form only and by way of example, but may variations and modifications may be made therein and in its mode of application which will still be comprised within its spirit. It is understood, therefore, that the invention is not limited to any specific form or embodiment, except insofar as such limitations are specified in the appended claims.

What is claimed is:

1. Apparatus for printing and assembling a pack of checking account forms including personalized checks and deposit slips, said apparatus comprising a first printing unit for imprinting the depositors identification mark on the forms that make up the aforesaid pack, a conveyor board for feeding forms to said first printing unit, a suction feed mechanism for delivering check blanks to said conveyor board, a friction feed mechanism for delivering deposit slip blanks to said conveyor board, means settable in accordance with the number of check blanks desired to be fed by said suction feed mechanism to said conveyor board, additional means settable in accordance with the number of deposit slips desired to be fed by said friction feed mechanism to said conveyor board, first counting means to count the number of check blanks fed by said suction feed mechanism, second counting means to count the number of deposit slips fed by said friction feed mechanism, means responsive to the feed of the desired number of forms by one of said feed mechanisms for arresting further feed of forms by said mechanism and initiating the feed of forms by the other of said feed mechanisms, means responsive to the feed of the desired number of forms by said other of said feed mechanisms for arresting further feed of forms therefrom, a second printing unit connected in tandem with said first printing unit and having a numbering head for numbering the check blanks fed thereto, a cam for indexing the numbering head so that the blank checks are numbered sequentially, a solenoid for moving said cam into and out of indexing position, means for determining when deposit slips are being fed to said second printing unit, means for controlling said solenoid so that said cam is out of indexing position when deposit slips are being printed, and a delivery mechanism for delivering forms from said second printing unit to an assembly station where a pack of checking account forms is assembled.

2. Apparatus according to claim 1 wherein said determining means includes a sheet counting means associated with said second printing unit for moving said cam into indexing position when the check blanks are being printed and out of indexing position when the deposit slips are being printed in said second printing unit.

3. Apparatus for producing a series of check books each of which includes a number of personalized and sequentially numbered checks, a number of deposit slips and a check book reorder form, comprising a first printing unit for printing the depositor's identification mark on the check blanks and deposit slips, a means for feeding check blanks to said first printing unit, a separate means for feeding deposit slips to said first printing unit, an additional separate means for feeding reorder forms to said first printing unit, a second printing unit for sequentially numbering the checks and check stubs, a conveyor table to transport the check blanks, deposit slips and reorder forms to said second printing unit, and a delivery mechanism for transporting said completed check blanks, deposit slips and reorder forms to a final assembly station, wherein said second printing unit comprises a main shaft rotating in synchronization with said first printing unit, a series of numbering heads mounted on said shaft for sequentially numbering the check blanks, a pair of selectively operative indexing cams for indexing each numbering head for each check it numbers, and means for selectively operating said indexing cams only when check blanks are being fed through said second printing unit.

4. Apparatus according to claim 3 wherein said last named means includes a pair of cross rods mounted between two machine frame support bars, a pair of plates slidably mounted on said cross rods, said plates also having the indexing cams mounted thereon, a second pair of short rods which maintain said plates at a fixed distance from one another, a pair of springs to normally hold said plates and indexing cams inoperative, a third plate fixedly mounted on said cross rods, and a solenoid mounted on said third stationary plate which when energized functions to move the pair of plates and the indexing cams into operative position.

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